Application of dual reciprocity boundary element method to predict acoustic attenuation characteristics of marine engine exhaust silencers(PDF)

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摘要: In marine engine exhaust silencing systems,the presence of exhaust gas flow influences the sound propagation inside the systems and the acoustic attenuation performance of silencers.In order to investigate the effects of three-dimensional gas flow and acoustic damping on the acoustic attenuation characteristics of marine engine exhaust silencers,a dual reciprocity boundary element method (DRBEM)was developed.The acoustic governing equation in three-dimensional potential flow was derived first,and then the DRBEM numerical procedure is given.Compared to the conventional boundary elementmethod (CBEM),the DRBEM considers the second order terms of flow Mach number in the acoustic governing equation,so it is suitable for the cases with higher Mach number subsonic flow.For complex exhaust silencers,it is difficult to apply the single-domain boundary element method,so a substructure approach based on the dual reciprocity boundary element method is presented.The experiments for measuring transmission loss of silencers are conducted,and the experimental setup and measurements are explained.The transmission loss of a single expansion chamber silencer with extended inlet and outlet were predicted by DRBEM and compared with the measurements.The good agreements between predictions and measurements are observed,which demonstrated that the derived acoustic governing equation and the DRBEM numerical procedure in the present study are correct.

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